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VOLUME, HEAT AND FRESHWATER FLUXES OF PACIFIC WATER THROUGH THE BARROW CANYON IN THE ARCTIC OCEAN

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Over the past few decades, sea ice retreat during summer has been enhanced in the Pacific sector of the Arctic Basin, in part due to increasing summertime heat flux of Pacific-origin water from the Bering Strait. Barrow Canyon, in the northeast Chukchi Sea, is a major conduit through which the Pacific-origin water enters the Arctic Basin. Our study focuses on the quantitative estimate of volume, heat and freshwater fluxes through Barrow Canyon by mooring observations with hydrographic surveys. We conducted year-round mooring observations at one station from 2000 to 2001 and at three stations from 2001 to 2014 in the mouth of Barrow Canyon. The annual mean poleward volume, heat and freshwater fluxes through Barrow Canyon were 0.49 Sv, 31 mSv and 2.25 TW. Annual mean Pacific Water transport through Barrow Canyon represents 55% of the long-term mean Pacific Water inflow through the Bering Strait. The annual averaged heat flux displayed substantial interannual variability, ranging from 0.93 TW to 3.34 TW. Annual averaged volume and freshwater fluxes in recent years from 2010 to 2014 were lower than the 2000–2008 averages, mainly due to relatively strong northeasterly wind. In contrast, heat fluxes for the period 2010–2014 were higher than the 2000–2008 averages, and 1.3 times larger than the average value from 2001 to 2014. It tended to be three highest maximum in 2007, 2010 and 2012, when summer sea ice extent extraordinary retreats in the Arctic Ocean, mainly because of the warming of Pacific Summer Water. Heat fluxes observed in these years are sufficient to melt 1-m-thick ice over an area of 360,000 km^2, which is nearly equals to the total land area of Japan. They were 3–4 times larger than that observed in summer 1993. The heat possibly contributes to both sea-ice melt in summer and a decrease in sea-ice formation during winter because this water typically subsides just below the surface mixed layer in the Arctic Basin.